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AUTHOR Chauvin, Sheila W.; Bowdish, Bruce E.
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ABSTRACT

A student perceptions measure of college and university classroom learning environment was developed to reflect the dynamic interplay among contextual variables and accommodates theoretical and practical applications in light of logistical concerns found in such complicated educational settings as a medical school. The 18-item Teaching and Learning Environment Questionnaire (TLEQ) was developed using elements of effective teaching and learning processes documented in the professional literature. The sample included all second year medical students in a medical school in 2 years, for a total of 296 participants (345 usable questionnaires). The TLEQ was administered in pharmacology and pathology courses in five instructional settings, including problem-based learning and computer-assisted learning, using one of four data collection formats. Results suggest that the TLEQ is a flexible and easy-to-administer measure of students' personal perceptions of classroom learning environments that has the potential to contribute substantially to faculty and instructional development efforts in medical schools specifically and in other professional schools in general. The TLEQ reflects marker variables for two distinct factors that clearly define the nature of effective postsecondary classroom learning environments. One represents teaching and learning context and the other represents learner involvement. (Contains 3 tables and 28 references.) (SLD)

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AN EXPLORATORY FACTOR ANALYSIS TO ESTABLISH THE CONSTRUCT VALIDITY OF THE *TEACHING AND LEARNING ENVIRONMENT QUESTIONNAIRE* (TLEQ)

Sheila W. Chauvin & Bruce E. Bowdish

Tulane University School of Medicine

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An Exploratory Factor Analysis to Establish the Construct Validity of the *Teaching and Learning Environment Questionnaire* (TLEQ)

Sheila W. Chauvin & Bruce E. Bowdish
Tulane University School of Medicine

Introduction

In recent years, the professional education literature has documented a persistent and growing trend toward assessing and enhancing the quality of teaching and learning in post secondary education, including undergraduate studies, graduate studies, professional schools (e.g., medical schools), and continuing education. Prominent among these initiatives is the use of questionnaires to obtain students' perceptions of teaching effectiveness (Braskamp & Ory, 1994; Centra, 1993; Seldin, 1993; Theall & Franklin, 1991). A review of the literature on students' perceptions of teaching and learning effectiveness suggests that many instruments focus on discrete teacher behaviors or characteristics and/or students' satisfaction (i.e., likes and dislikes), with little, if any, focus on aspects of students' learning and involvement. Student perception measures of classroom learning environments have, to date, focused primarily on interpersonal and psychosocial aspects, with less attention to the contextual elements of learning environments and the dynamic interplay between teachers' and students' contributions to the effectiveness of these teaching/learning situations (Ellett, Loup, & Chauvin, 1991a). Although considerable literature is available pertaining to elementary/secondary and higher education settings, generally, a search of the literature pertaining to students' perceptions of teaching effectiveness in medical schools produced few citations and only four citations were found linking student perceptions, learning environment, and medical schools. Noteworthy, these four citations focused on school

strategies), and exploring relationships between classroom learning environments and specific outcome variables.

Background Perspectives

The literature on student perceptions of teaching and learning, faculty evaluation, and course/program assessment converge on the recognition of teaching and learning effectiveness as a complex phenomenon and on recommendations for using multiple methods and data sources when determining the effectiveness of faculty teaching, courses, or programs. Gray (1991) argues that assessments of teaching effectiveness should focus on three essential components, including content, process, and impact, and be flexible enough to accommodate the contextual features that cause teaching and learning processes to vary from one situation to the next. Scriven (1994) points out that contextual and pragmatic issues such as the assessment purpose, length of the rating questionnaire, and willingness of the students to participate can significantly impact the validity, reliability, and utility of such instruments and processes.

The professional literature pertaining to the study of learning environments also supports a focus on contextual or environmental features, and reflects a variety of methodologies, including direct observation, questionnaire, and interview. While most studies of learning environment have been conducted in elementary and secondary environments (Giddings, Fraser, & McRobbie, 1992; Ellett, Loup, & Chauvin, 1991a), more recent investigations have been conducted in post secondary settings (Clarke, 1995; Cleave-Hogg & Rothman, 1991; Loup, Ellett, Culross, & Evans, 1993; Evans & Ellett, 1991; Fraser, Treagust, Williamson, & Tobin, 1987; and Robins, 1996) and suggest that interested researchers might draw on insights gained in studies involving

elementary and secondary schools to enhance teaching and learning effectiveness in post secondary settings.

The efforts of Fraser, et al. (1987) have provided a student perceptions measure of learning environment for higher education, the *College and University Classroom Environment Inventory (CUCEI)*. The CUCEI is similar to other measures of classroom learning environment described in Fraser (1992) in that it focuses primarily on the psychosocial aspects of classroom situations. While the CUCEI is appropriate for use in small class situations (e.g., seminars and tutorials), the authors state that it is not appropriate for use in lectures or laboratory formats.

The *System for Teaching and learning, Assessment and Review* (STAR) (Ellett, Loup, & Chauvin, 1991b) was developed originally for use in elementary and secondary classrooms as a comprehensive, on-the-job assessment system. The STAR extended the extant teacher evaluation literature of the time by focusing observation-based assessment on teaching *and* learning, and context-specific decision making, rather than discrete teacher behaviors and characteristics. Evans and Ellett (1991) demonstrated the effectiveness of adapting the STAR to college classrooms for purposes of faculty development. Loup, Ellett, Culross, & Evans (1993) further extended the application of the STAR by developing the *Student Assessment of Teaching and Learning* (SATL). The 65-item SATL includes components of the STAR such as preparation and classroom management, interpersonal skills, enhancement of learning, student evaluation practices, and types of learning (e.g., thinking skills, concept learning, and levels of understanding).

One of the researchers (SWC) has explored the applicability of the STAR in various teaching and learning situations a medical school environment. Observations, thus far, appear to

reiterate the findings of Evans and Ellett (1991) and support the applicability of the STAR in biomedical and clinical learning environments. However, direct observations of classroom learning environments using the STAR framework is time consuming and difficult, as few trained assessors are available. Similarly, high demands on faculty members' and students' time, coupled with resource constraints and the multiple roles expected of individual faculty and faculty development specialists, present significant logistical concerns related to preparing additional STAR assessors.

Although the SATL (Loup, Ellett, Culross, & Evans, 1993) provides a valid student perceptions measure for large and small group college settings, its length (65 items) presents additional logistical concerns. For example, administering questionnaires such as the SATL in a medical school environment must compete with tight curriculum schedules to afford students or faculty adequate time to complete the measure. Frequently, students fail to complete questionnaires pertaining to teaching and/or course effectiveness, especially lengthy ones, and response rates suffer accordingly. Data collection for formative purposes is problematic in many medical school learning environments, as large numbers of faculty members are involved in teaching a course, rather than just one or two professors. For example, up to 40 professors may teach classes in a single basic science course (e.g., gross anatomy, physiology or pathology) and even larger numbers of faculty members are involved in teaching clinically oriented courses (e.g., clinical foundation courses and clerkships). Teaching and learning encounters in the clinical setting are further complicated by the presence of patients, family members, other health professionals, and competing and unpredictable service demands. Finally, strong traditions and cultural norms, coupled with limited backgrounds in educational theory and practice, present formidable

constraints to formative processes and theory-based research. While faculty members and students express interest in enhancing teaching and learning effectiveness and their understanding of the relationship between teaching and learning processes and student outcomes, the logistical and normative issues are a concern in obtaining valid and reliable data. Therefore, we were prompted to develop a student perceptions measure of college/university classroom learning environment that reflects the dynamic interplay among contextual variables (e.g., teacher, learner, content, and context) and accommodates theoretical and practical applications in light of logistical concerns faced in high-paced, diverse, and complicated educational settings such as in a medical school.

Limitations

Every study occurs within a set of unique characteristics and limitations. This study is no exception. Therefore, the findings reported here and the conclusions in the discussion that follows should be interpreted accordingly. Although the study took place in a medical school setting that is typical of many United Stated medical schools, we recognize that each school has its own structure, function, and culture. There is the saying, "If you have seen one medical school, you have seen one medical school." The same might be said for other higher education institutions. Therefore, the generalizability of the results and conclusions of this study will be limited by the extent to which other settings are similar to the situation in which this study occurred. Faculty and students participated in the study voluntarily. No faculty members whom we asked refused participation, nor did students who attended classes; however, limitations that are typically associated with volunteers and intact classes are acknowledged.

While we are interested in pursuing investigations of the TLEQ in clinical settings, none were included in this study. All data collection occurred in basic science teaching and learning situations that reflected primarily formal classroom learning environments (e.g., lectures, small group discussions, and hypermedia-assisted learning sessions). Although explorations of clinical settings using direct observation and the STAR instrument suggest that the elements of effective teaching and learning environments are observable in clinical settings, we have not yet explored the effectiveness of the TLEQ in these situations.

Methodology

The 18-item *Teaching and Learning Environment Questionnaire* (TLEQ) was developed using elements of effective teaching and learning processes documented in the professional literature (e.g., Bonwell & Eison, 1991; Feldman & Paulsen, 1994; Johnson, Johnson, & Smith; 1991; Lowman, 1995; Sutherland & Bonwell, 1996) and previously developed measures of effective teaching and learning such as the STAR (Ellett, Loup, & Chauvin, 1991b) and the SATL (Loup, Ellett, Culross, & Evans, 1993). Given that we were concerned primarily with developing a concise, holistic, questionnaire that might be used in complementary ways with other learning environment measures (e.g., the STAR, SATL, or CUCEI), we sought to develop an initial set of questionnaire items that adequately reflected key characteristics of *teaching and learning context* (TLC) and *learner involvement* (LI). Following the recommendations of Tabachnick and Fidell (1989), we sought to identify items or variables that would be highly correlated with one and only one of the two hypothesized factors (TLC or LI) and serve as *marker variables*. According to Tabachnick and Fidell (1989), "*Marker variables are useful because they define clearly the nature of a factor; adding potential variables to a factor to round it out is much more*

meaningful if the factor is unambiguously defined by marker variables to begin with." (p.602). Table 1 shows the TLEQ items and their correspondence to the various components of the STAR. Examples shown in Table 1 include Items 1 and 2 (Factor I) that correspond with the *time* component of the STAR; whereas, Item 16 (Factor II) reflects the STAR component pertaining to *thinking skills* and Item 18 (Factor I) reflects an element of personalization that is part of the *psychosocial learning environment* component of the STAR.

The sample for this study consisted of all second year medical students enrolled in one southeastern, private medical school during the 1996-1997 and 1997-1998 academic years. Each cohort consisted of 148 students, for a total of 296 participants. Data were collected in a variety of learning environments in which faculty members agreed to our administration of the TLEQ. The students and faculty members involved in the study were introduced to the TLEQ and the purpose of the study prior to data collection.

The TLEQ was administered in pharmacology and pathology courses during the Spring 1997 and Spring 1998 by one of the researchers (SWC or BEB) to facilitate students' participation and ensure confidentiality. Data were collected in five different instructional settings and using one of four different data collection formats for the TLEQ. In the pharmacology course, the TLEQ data were collected in problem-based learning (PBL) small group sessions using a paper-and-pencil questionnaire. In the pathology course, data were collected on three occasions in the spring 1997 and one occasion in the spring 1998 under the following conditions: 1) traditional lecture (TLEQ slide projection with an optical mark response (OMR) form); 2) lecture using network-based image projections and animation (TLEQ slide projection with OMR

Table 1

Correspondence Between Each Item of the *Teaching and Learning Environment Questionnaire* (TLEQ) and the *System for Teaching and learning, Assessment and Review* (STAR)

TLEQ Item	STAR Component
1. Time was used effectively for my learning.	Time
2. The time allotted was sufficient for my learning.	Time
3. I understood what was expected of me.	Monitoring and Maintaining Student Behavior
4. The session was well organized.	Classroom Routines Teaching Methods and Learning Tasks Learning Equity
5. The session-leader was adequately prepared.	Classroom Routines Teaching Methods and Learning Tasks Aids and Materials
6. The session format motivated me to learn.	Managing Student Engagement Psychosocial Learning Environment Learning Equity Lesson and Activities Initiation
7. The learning objectives were clear.	Lesson and Activities Initiation
8. Educational materials were relevant to my learning.	Aids and materials
9. The session-leader was enthusiastic about teaching.	Psychosocial Learning Environment
10. The session-leader was enthusiastic about my learning.	Psychosocial Learning Environment
11. I related session content to real-life or clinical applications.	Psychosocial Learning Environment
12. The content was at an appropriate level of difficulty.	Content Structure and Emphasis
13. The session proceeded at an appropriate pace.	Teaching Methods and Learning Tasks Content Structure and Emphasis

Table 1 (continued)

TLEQ Item	STAR Component
14. I contributed comments or questions in the session.	Learning Equity
15. I had sufficient opportunities to learn.	Learning Equity Monitoring Learning Tasks and Informal Assessment
16. I engaged in critical analysis and problem-solving.	Thinking Skills
17. I received feedback that was relevant to my learning.	Feedback
18. I learned to relate important concepts to medical practice.	Psychosocial Learning Environment Content Accuracy and Emphasis

form), 3) interactive, case-based large class (TLEQ paper-and-pencil questionnaire with OMR form), and 4) web-based, computer-aided instruction (TLEQ computer/network-based response screen at the end of the instructional module). According to the school policy, student attendance at each of these sessions was voluntary, therefore data were obtained at the end of each teaching and learning experience from students who attended/participated until the end of the class period. Observation data verified that very few, if any, students left prior to the end of the class period.

Data screening techniques and descriptive studies were completed prior to conducting an exploratory factor analysis using principal components analysis (PCA) and principal axis factoring (PAF), orthogonal and oblique techniques (SPSS for Windows Version 8.0, 1998). Unconstrained solutions were generated, interactively extracting appropriate factors, based upon an examination of factor eigen values. Examinations of scree tests, factor loadings, eigen values,

variances explained, and conceptual fit of the items with each factor were also used in determining the best and most reasonable representation of the data.

A set of decision rules was established and used in interpreting the results of the factor analysis and determining the solution that best represented the data. An item was retained using the following decision rules as a guide: 1) only if its loading on a given factor was greater than or equal to .30; 2) only on the factor for which its loading was greatest; 3) only if it loaded primarily on one factor; and 4) if, when loading on multiple factors, the difference between loadings was greater than or equal to.20.

Results

Useable data from 345 questionnaires yielded mean scores ranging from 2.56 to 4.49 on a 5-point Likert scale (*Definitely No to Definitely Yes*). Table 2 shows the mean, standard deviation and percentage of maximum possible scores for each TLEQ item. These data represent a 100% response rate from the students who attended/participated in each teaching/learning experience.

On average, students were able to complete the TLEQ in less than ten minutes, including time to write narrative comments. Many of the completed forms contained substantial written comments. Administration of the 18 items via the slide projection method revealed that students were able to respond to the items in approximately five minutes.

According to Tabachnick and Fidell (1989), one should be cautious about pooling the results of several samples, or a sample with measures repeated over time. For example, samples that are known to differ on some characteristic may produce different factors. Similarly, if the same subjects are used with repeated measures, the underlying factor structure may shift in time due to their learning or experience with an experimental setting. Tabachnick and Fidell (1989)

Table 2

Summary Descriptive Statistics for Each Item of the TLEQ for Second Year Medical Students (n = 345)

	Item	M[a]	SD[b]	% Max[c]
1.	Time was used effectively for my learning.	3.94	1.09	78.80
2.	The time allotted was sufficient for my learning.	3.98	1.16	79.60
3.	I understood what was expected of me.	3.84	1.14	76.80
4.	The session was well organized.	4.08	1.21	81.60
5.	The session-leader was adequately prepared.	4.49	.81	89.80
6.	The session format motivated me to learn.	3.67	1.22	73.40
7.	The learning objectives were clear.	3.93	1.10	78.60
8.	Educational materials were relevant to my learning.	4.17	1.01	83.40
9.	The session-leader was enthusiastic about teaching.	3.91	1.15	78.20
10.	The session-leader was enthusiastic about my learning.	3.71	1.23	74.20
11.	I related session content to real-life or clinical applications.	3.79	1.20	75.80
12.	The content was at an appropriate level of difficulty.	4.12	1.21	82.40
13.	The session proceeded at an appropriate pace.	3.89	1.18	77.80
14.	I contributed comments or questions in the session.	2.56	1.63	51.20
15.	I had sufficient opportunities to learn.	3.95	.99	79.00
16.	I engaged in critical analysis and problem-solving.	3.10	1.37	62.00
17.	I received feedback that was relevant to my learning.	3.10	1.42	62.00
18.	I learned to relate important concepts to medical practice.	3.89	1.17	77.80

[a] M = Item mean score
[b] SD = Standard deviation
[c] Percentage of maximum possible score is calculated by dividing the item mean score by the maximum possible score for the item (e.g., 2.56/5 =51.2% or 3.94/5 = 78.8%).

recommends examination of the factor analysis for each sample and if the samples produce the same factors, the samples should be combined and the results of a single factor analysis study should be reported. In the present study we followed this recommendation and our preliminary findings supported combining data and reporting the results of a single factor analysis that follows.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .94, judged as *marvelous* (SPSS for Windows, 1998). The alpha reliability coefficient was .93. The results of the PCA and PAF revealed two factors explaining 62.32% of the total variance in the data. As shown in Table 3, Factor I included fifteen (15) items with factor loadings ranging from .60 to .88. The content of the items loading on Factor I represented *contextual elements* of the teaching and learning environment. Items loading on Factor I reflected students' perceptions of key elements of context including organization, preparation, enthusiasm, allocation and use of time, student expectations, use of educational materials, content difficulty, pace, opportunities for learning, concept learning, and real-life application. Based on these findings, we elected to label the TLEQ subscale represented by Factor I *Teaching and Learning Context*. In the two-factor solution, Factor I had an initial eigen value of 8.96 and an eigen value of 8.42 after oblique rotation. Factor I accounted for 49.76% of the variance in the data.

Factor II included three items with factor loadings ranging from .68 to .82. Items loading on this factor represented *learner involvement* and included students' personal perceptions of their involvement during class (e.g., contributing comments or asking questions, engaging in critical analysis and problem-solving) and the extent to which they believed they received relevant and specific feedback. Factor II had an initial eigen value of 2.26 and eigen value of 2.83 after

Table 3

Summary of Factor Pattern Coefficients for the Teaching and Learning Environment Questionnaire (TLEQ) (n = 345)

	Item	Factor I	Factor II
1.	Time was used effectively for my learning.	.82	
2.	The time allotted was sufficient for my learning.	.76	
3.	I understood what was expected of me.	.60	
4.	The session was well organized.	.88	
5.	The session-leader was adequately prepared.	.64	
6.	The session format motivated me to learn.	.67	
7.	The learning objectives were clear	.76	
8.	Educational materials were relevant to my learning.	.73	
9.	The session-leader was enthusiastic about teaching.	.72	
10.	The session-leader was enthusiastic about my learning.	.76	
11.	I related session content to real-life or clinical applications.	.62	
12.	The content was at an appropriate level of difficulty.	.73	
13.	The session proceeded at an appropriate pace.	.77	
14.	I contributed comments or questions in the session.		.82
15.	I had sufficient opportunities to learn.	.71	
16.	I engaged in critical analysis and problem-solving.		.78
17.	I received feedback that was relevant to my learning.		.68
18.	I learned to relate important concepts to medical practice.	.77	

Total Variance Explained = 62.32%

oblique rotation. Factor II accounted for 12.56% of the variance in the data and was labeled as the *Learner Involvement* subscale of the TLEQ. All 18 items loaded on only one factor; thus, no items were deleted as a result of the two-factor solution.

Discussion

In the present study we conceptualized classroom learning environments holistically (Ellett, Loup, & Chauvin, 1991a), rather than in terms of psychosocial elements only (Ellett, 1986; Fraser, 1986). We also conceptualized classroom learning environments to include a variety of class sizes and formats ranging from large classes (80-150 students) (e.g., traditional lectures, case-based lecture/discussions, and hypermedia-assisted lectures) to student-centered, small group sessions (8-12 students) (e.g., problem-based learning) to self-directed, computer-assisted learning. While we did not include informal group discussions (e.g., real-time clinical situations) and bedside teaching sessions (e.g., teaching rounds or precepting) in the study, these types of teaching/learning situations were included in our conceptualization of classroom learning environments and we intend to include these types of settings in future investigations involving the TLEQ.

Our initial development of the TLEQ was guided by a desire to develop a concise, but holistic, student perceptions measure that reflected elements of effective *teaching and learning* environments and was flexible enough to accommodate not only large classes/lectures, but also small groups, laboratories, and informal, clinical learning situations. We chose to emphasize various large class/lecture formats in the present study because of their persistent prevalence in medical school curricula, both in the target school and in other United States medical schools (Association of American Medical Colleges, 1997). In addition, the applicability of the TLEQ to

these types of settings could substantially enhance our effectiveness in working with faculty members to structure large classes/lectures in ways that encourage students' active involvement in learning and thinking. Although large classes/lectures will likely remain a major part of medical education curricula in schools throughout the United States, medical educators are very much involved in encouraging the use of student-centered small group and self-directed learning formats, especially in the basic sciences (Association of American Medical Colleges, 1992). Therefore, we also examined the appropriateness of the TLEQ for student-centered, small group sessions and self-directed, computer-aided learning sessions as well.

The results of this study are encouraging and add to the work of others (e.g., Clarke, 1995; Ellett, McMullen, Rugutt, & Culross, 1997; Loup, et al., 1993; Fraser, et al., 1987) who have contributed to the assessment of classroom learning environments in higher education settings. The findings also suggest that the TLEQ is a flexible and easy-to-administer measure of students' personal perceptions of classroom learning environments that has the potential to substantially contribute to faculty and instructional development efforts in medical schools, specifically, and in other professional schools (e.g., law, engineering, teacher education, business) and higher education, generally. Certainly, using the TLEQ as part of faculty and instructional development activities has the potential for facilitating common understandings about effective teaching and learning practices across various disciplines -- a need that is recognized commonly in United States institutions of higher education and particularly in medical school settings. The TLEQ may also be useful for assessing and enhancing the quality of continuing medical education programs, a growing and changing venue for lifelong learning among physicians.

Results of our initial instrument development suggest that the TLEQ reflect *marker variables* for two distinct factors (Tabachnick & Fidell, 1989) that define clearly the nature of effective post secondary classroom learning environments. Factor I (*Teaching and Learning Context*) reflects essential elements of effective teaching and learning processes that are documented in the literature across levels and settings (Bonwell & Eison, 1991; Braskamp & Ory, 1994; Centra, 1993; Clarke, 1995; Ellett, Loup, & Chauvin, 1991a). Specifically, and as reflected in the items shown in Table 3, items on the *Teaching and Learning Context* (TLC) subscale (Factor I) reflect the effective use of time and materials; preparation, structure, and organization of teaching and learning processes; psychosocial elements (e.g., enthusiasm, motivation, real-life relevance, and sufficient opportunities to participate and learn); content structure and emphasis (e.g., concepts and content difficulty); and the pace of teaching and learning. The elements reflected in the TLC subscale align well with the STAR framework and provide a set of marker variables that reinforce the perspective of viewing classroom learning environments holistically.

The particular features of teaching and learning contexts represented in the TLC subscale have been documented as essential elements of effective post secondary classroom learning environments in other studies (e.g., Clarke, 1995; Ellett, et al., 1997). For example, Clarke (1995) reported that college students perceived effective teaching to be relevant, experiential and interactive, while ineffective teaching was perceived to lack structure and discipline, be inappropriately paced, and lack variety. Ellett, et al. (1997) reported that students' personal perceptions of their learning environments were significantly related to their self-reports of learning enhancement. Of course, items pertaining to other elements of teaching and learning

(e.g., clarification or misunderstanding or clarity of communication) might be considered for inclusion in refining or *rounding out* the TLEQ.

We conceptualized Factor II as the *Learner Involvement* (LI) subscale of the TLEQ because it represents students' self-perceptions of their active involvement in contributing to their classroom learning environments, in thinking, and in judging the effectiveness of feedback about their learning. Despite the small number of items for the LI subscale (n = 3), the strength of the factor loadings (.68 -.82) are very encouraging. Also, the content represented in the items appear to align clearly with general conclusions drawn by researchers who study the impact of students' active involvement in learning on their achievement in post secondary settings (e.g., Bonwell & Eison, 1991; Johnson, Johnson & Smith, 1991; Kurfiss, 1988).

From a practical perspective, the TLEQ and the STAR might be useful for viewing classroom learning environments holistically through multiple and simultaneous lenses. For example, the STAR, a direct observation system, and the TLEQ, a measure of students' personal perceptions, might be used concurrently to examine the effectiveness of *actual* classroom learning environments *in situ*. Other applications of the TLEQ are possible as well. For example, faculty members' and students' perceptions could be examined in terms of both preferred and actual classroom learning environments. Given that supporting results are obtained in future validation studies, the STAR, TLEQ and SATL might be used to develop comprehensive profiles for examining teaching and learning environments for specific units, blocks, rotations, courses, or clerkships formatively and summatively over time.

Conclusions and Future Directions

Results of this study are encouraging and suggest that the TLEQ is a valid and reliable measure of students' personal perceptions of teaching and learning environments. Pilot testing of various administration formats (e.g., paper-and-pencil, slide projection, and computer-based) suggests that the TLEQ is easy-to-administer and can be used in variety of classroom settings, including traditional lecture, web-based lecture presentations, small group sessions, and self-directed, independent use of computer-aided instruction.

Our plans for future investigations include instrument refinement, confirmatory factor analyses, and other validation efforts. Pilot studies utilizing the TLEQ in other educational settings (e.g., clinical situations, teaching rounds, or precepting), and in providing faculty and instructional development consultations are envisioned. Finally, we intend to pursue investigations involving the TLEQ to examine relationships between teaching and learning process variables and specific student outcomes.

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